

U.S. Patent Application No. 10/520,075
Attorney Docket No. 17885 A
Page 2

RECEIVED
CENTRAL FAX CENTER
JUN 08 2007

Amendments to the Specification:

In the title, replace "TRUE POSITION BENCH" with

—OPTICAL BENCH HAVING V-GROOVE FOR ALIGNING OPTICAL
COMPONENTS—

After the paragraph starting on Page 5, line 15, insert the following:

--Fig. 5 is side view of another embodiment of the optical assembly using the true position bench of the present invention in which the second optical component is a substrate-type optical component like the first optical component shown in Fig. 1.

Figs 6(a)-(f) depict schematically different stages in the preparation of the first optical component.--

In the paragraph starting on Page 9, line 16:

Referring to Figs. 6(a)-(f), a preferred method of preparing the first optical component is shown schematically. In a preferred embodiment, the method of preparing a first optical component for incorporation into the optical assembly comprises: (a) defining (i) the location 61 of at least two parallel V-grooves 67 in a wafer 60 to define at least one center portion 62 between two V-grooves and a side portion 65 on either side of the center portion 62, and (b) defining (ii) a fiducial location 64 for mounting an optical element 68 on the center portion between the parallel V-grooves 67 wherein the fiducial being a certain distance relative to the parallel V-grooves; (c) etching the V-grooves 67 to define side walls 67a, 67b for each V-groove; (d) creating a fiducial 66 in the fiducial location 64; (e) securing an optical element 68 to the center portion 62 relative to the fiducial 66; and (f) separating the side portions 65 from the center portion 62. It should be obvious that once the center portion is separated from the side portions, it becomes the first optical component 69. (Likewise, the center portion 62 it becomes the substrate 5 as shown in Fig. 3.) Finally, as shown in (f), the first optical component 69 is inverted and disposed in the upwardly-facing V-groove 70 of said platform 71 such that the first

RECEIVED
CENTRAL FAX CENTER

U.S. Patent Application No. 10/520,075
Attorney Docket No. 17885 A
Page 3

JUN 08 2007

optical component 69 is supported by the platform 71 solely by the contact of side walls 67a, 67b against the sides 70a, 70b of the V-groove 70.

In the paragraph starting on Page 9, line 25:

Preferably, steps (a) and (b) are performed in a single photolithography step.

The present invention is particularly well suited for the manufacture of such a component since all of the critical dimensions may be defined in a single photolithography step. That is, during the step in which the V-grooves are defined in the silicon wafer (which, as mentioned above, define sides 67a 6a and 67b 6b) fiducials for locating the optical element 9-68 (and its first optical axis 10a) may be defined on the substrate 5 too. Thus, the critical distance of the optical axis 10a from sides 6a67a -and 67b 6b can effectively be accomplished in a single step, thereby eliminating tolerance build up and simplifying manufacturing.

In the paragraph starting on Page 10, line 5:

The fiducials may be any structure or marking on the center portion which provides for the passive alignment of the optical element on the center portion. For example, the fiducials may be physical structures having a register surface against which the optical element may contact to be positioned correctly on the center portion. Alternatively, the fiducials may be markings to enable visual alignment of the optical element on the center portion using a commercially-available, ultra-high precision die bonding machine, such as, for example, a Suss MicroTec machine (See, e.g., U.S. Application No. 20020119588, incorporated herein by reference). In a preferred embodiment though, as shown in Fig. 4, the fiducials comprise a certain pattern of solder pads 41-66a (or pads 41 as shown in Fig. 4) on the center portion 62 which match a certain pattern of solder pads on the optical element 68. This way, alignment is achieved in step (c) when the optical element 9-68 is placed over the first solder pads 66a and the solder of the optical element and center portion is reflowed such that the surface tension of the solder causes the pattern of the optical element to

U.S. Patent Application No. 10/520,075

Attorney Docket No. 17885 A

Page 4

align over the pattern on the center portion and thereby precisely position the optical element relative to the center portion.

In the paragraph starting on Page 10, line 18:

Preferably, the first optical component is produced *en masse* by exploiting wafer board processing techniques, and, in particular, the V-grooves which define the beveled sides. Specifically, in a preferred embodiment, more than two parallel V-groove locations 61 lines are defined in step (a) such that the center portion 62 is a side portion 65 relative to at least one of its side portions 65 (and, of course, the side portion 65 may be considered a center portion 62). In other words, a single V-groove 67 on the wafer can define a beveled side 67a, 67b for two adjacent portions on the wafer since the V-groove is separated down the middle in step (ef).

In the paragraph starting on Page 10, line 24:

The method of manufacturing the first optical component described above is broken down into particular steps for purposes illustration. It should be understood, however, that the method of the present invention is not restricted to these discrete steps and that these steps may be performed simultaneously or in any logical order.

In a preferred embodiment, step (ef) is performed after steps (a), (b), and (c), and (d).

Insert before the paragraph starting on Page 11, line 18:

Referring to Fig. 5, the second optical component is depicted as a substrate-type component, which is just like the first optical component described above. In this embodiment, the second optical component 54 has a second optical axis 10b, a reference surface 515 and two sides 56a, 56b, each side is beveled at the certain pitch a outwardly from the reference surface 515. The second optical component 54 being disposed in the V-groove 3 such that the reference surface 515 faces downward with respect to the top surface 14 and the sides 56a, 56b are in parallel contact with the walls 3a, 3b, respectively, of the V-groove 3.